

CLAIMS

1. Apparatus for use with a biologically-compatible-fluid pressure source, comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen;

a piston head coupled to a distal portion of the carrier and adapted to:

form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen, and

be advanced distally through the body lumen in response to pressure from the fluid pressure source,

the apparatus being configured to facilitate distal advancement of the piston head by facilitating passage of fluid out of the lumen from a site within the lumen distal to the piston head; and

an optical system, coupled to the carrier in a vicinity of the distal portion, the optical system having distal and proximal ends, and comprising:

an image sensor, positioned at the proximal end of the optical system;

an optical member having distal and proximal ends, and shaped so as to define a lateral surface, at least a distal portion of which is curved, configured to provide omnidirectional lateral viewing; and

a convex mirror, coupled to the distal end of the optical member, wherein the optical member and the mirror have respective rotational shapes about a common rotation axis.

2. The apparatus according to claim 1, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening of the GI tract.

3. The apparatus according to claim 2, wherein the GI tract includes a colon, and wherein the carrier is adapted to be inserted through the proximal opening of the colon.

4. The apparatus according to claim 2, wherein the piston head is adapted to be in direct contact with the wall of the GI tract after the carrier has been inserted into the GI tract.

5. The apparatus according to any one of claims 1-4, wherein the convex mirror is shaped so as to define an opening through which distal light can pass.

6. The apparatus according to claim 5, wherein the optical member is shaped so as to define a distal indentation in the distal end of the optical member.

7. The apparatus according to claim 5, wherein the optical member is shaped so as to define a proximal indentation in the proximal end of the optical member.

10 8. The apparatus according to claim 5, wherein the optical system comprises a distal lens, positioned distal to the mirror, the distal lens having a rotational shape about the common rotation axis.

9. The apparatus according to claim 5, wherein the optical system is configured to provide different levels of magnification for distal light arriving at the image sensor through the distal end of the optical system, and lateral light arriving at the image sensor through the curved distal portion of the lateral surface of the optical member.

10. The apparatus according to claim 2, wherein an outer surface of the piston head forming the pressure seal with the wall of the GI tract comprises a low friction coating suitable for facilitating sliding of the piston head against the wall of the GI tract.

20 11. The apparatus according to claim 2, comprising:
a fluid source; and
at least one fluid supply tube coupled to the carrier, the tube in fluid communication with the fluid source,

25 wherein the distal portion of the carrier is shaped so as to define one or more openings in fluid communication with the tube, the openings oriented so as to spray at least a portion of the optical member when fluid is provided by the fluid source.

12. The apparatus according to claim 2, comprising an inflation element, fixed in a vicinity of the distal portion of the carrier, and adapted to increase a diameter of the carrier in the vicinity to an extent sufficient to position the optical member a distance from the wall sufficient to enable omnidirectional focusing of the optical system.

13. The apparatus according to any one of claims 1-4 or 10-12, comprising a vent tube, wherein the apparatus is adapted to facilitate the passage of the fluid out of the GI tract through the vent tube.

14. The apparatus according to claim 13, wherein the vent tube is adapted to passively
5 permit the passage of the fluid out of the GI tract.

15. The apparatus according to claim 13, wherein the vent tube is adapted to be coupled to a suction source, whereby to actively facilitate the passage of the fluid out of the GI tract.

16. The apparatus according to any one of claims 1-4 or 10-12, wherein the piston
10 head is adapted to be inflated so as to form and maintain the pressure seal with the wall of the GI tract.

17. The apparatus according to claim 16, wherein the piston head is adapted to be intermittently deflated at least in part, while in the GI tract, whereby to facilitate the passage of the fluid out of the GI tract from the site within the GI tract distal to the piston
15 head.

18. The apparatus according to claim 16, wherein the piston head is shaped to define a proximal lobe and a distal lobe, the lobes being in fluid communication with each other.

19. The apparatus according to claim 16, comprising a piston-head-pressure sensor, adapted to sense a pressure within the piston head.

20. The apparatus according to claim 19, wherein the piston-head-pressure sensor is adapted to be disposed within the piston head.

21. The apparatus according to claim 19, wherein the piston-head-pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

22. The apparatus according to claim 21, wherein the piston-head-pressure sensor is
25 adapted to be disposed outside of the GI tract.

23. Apparatus for use with a biologically-compatible-fluid pressure source, comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

an inflatable piston head coupled to a distal portion of the carrier, the piston head shaped so as to define a proximal lobe and a distal lobe in fluid communication with each other, the piston head adapted to:

- 5 be inflated so as to form a pressure seal with a wall
 of the lumen after the carrier has been inserted into the
 lumen, and
 be advanced distally through the body lumen in
 response to pressure from the fluid pressure source.

24. The apparatus according to claim 23, wherein the lumen includes a gastrointestinal
10 (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening
of the GI tract.

25. The apparatus according to claim 24, wherein the GI tract includes a colon, and
wherein the carrier is adapted to be inserted through the proximal opening of the colon.

26. The apparatus according to claim 24, wherein the piston head is adapted to be in
15 direct contact with the wall of the GI tract after the carrier has been inserted into the GI
tract.

27. The apparatus according to claim 24,
wherein a volume of a first one of the lobes is adapted to decrease in response to a
constriction of the GI tract adjacent thereto,

20 wherein a volume of a second one of the lobes is adapted to remain constant in the
absence of a change in GI tract diameter adjacent thereto, even if the volume of the first
lobe is decreased, and

wherein a pressure within the first and second lobes is equal in steady state,
regardless of the decrease in volume of the first lobe.

25 28. The apparatus according to claim 24, wherein the distal lobe has a diameter
substantially equal to a diameter of the GI tract.

29. The apparatus according to claim 24, wherein the distal lobe has a length of
between 3 and 5 cm.

30 30. The apparatus according to claim 24, wherein the piston head is shaped so as to
define at least one lobe in addition to the first and second lobes.

31. The apparatus according to any one of claims 23-30, wherein the piston head is shaped so as to define an intermediate portion at which the proximal and distal lobes articulate.

5 32. The apparatus according to claim 31, wherein the intermediate portion has a diameter equal to between 10% and 40% of a diameter of the distal lobe.

33. The apparatus according to any one of claims 23-30, comprising a flexible vent tube, passing through the proximal and distal lobes of the piston head, and opening to a site within the GI tract distal to the piston head, and adapted to facilitate distal advancement of the piston head by facilitating passage of fluid from the site.

10 34. The apparatus according to claim 33, comprising a suction source, adapted to actively facilitate the passage of the fluid from the site.

35. The apparatus according to claim 33,
wherein a volume of a first one of the lobes is adapted to decrease in response to a constriction of the GI tract adjacent thereto,

15 wherein a volume of a second one of the lobes is adapted to remain constant in the absence of a change in GI tract diameter adjacent thereto, even if the volume of the first lobe is decreased, and

wherein a pressure within the first and second lobes is equal in steady state, regardless of the decrease in volume of the first lobe.

20 36. The apparatus according to claim 33, wherein the distal lobe has a diameter substantially equal to a diameter of the GI tract.

37. The apparatus according to claim 33, wherein the distal lobe has a length of between 3 and 5 cm.

25 38. The apparatus according to claim 33, wherein the piston head is shaped so as to define at least one lobe in addition to the first and second lobes.

39. The apparatus according to claim 33, wherein the piston head is shaped so as to define an intermediate portion at which the proximal and distal lobes articulate.

40. The apparatus according to claim 39, wherein the intermediate portion has a diameter equal to between 10% and 40% of a diameter of the distal lobe.

30 41. Apparatus comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen;

a balloon coupled to a distal portion of the carrier and adapted to be in direct contact with a wall of the lumen after the carrier has been inserted into the lumen; and

5 a hydrophilic substance disposed at an external surface of the balloon.

42. The apparatus according to claim 41, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening of the GI tract.

43. The apparatus according to claim 42, wherein the GI tract includes a colon, and
10 wherein the carrier is adapted to be inserted through the proximal opening of the colon.

44. The apparatus according to any one of claims 41-43, wherein the balloon is shaped so as to define a proximal lobe and a distal lobe, the lobes being in fluid communication with each other.

45. Apparatus comprising:

15 an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

a balloon coupled to a distal portion of the carrier and adapted to be in direct contact with a wall of the lumen after the carrier has been inserted into the lumen, an outer surface of the balloon in contact with the wall of the lumen comprising a low friction
20 coating suitable for facilitating sliding of the balloon against the wall of the lumen.

46. The apparatus according to claim 45, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening of the GI tract.

47. The apparatus according to claim 46, wherein the GI tract includes a colon, and
25 wherein the carrier is adapted to be inserted through the proximal opening of the colon.

48. The apparatus according to claim 46, wherein the low friction coating comprises a lubricant.

49. The apparatus according to any one of claims 45-48, wherein the balloon is shaped so as to define a proximal lobe and a distal lobe, the lobes being in fluid communication
30 with each other.

50. Apparatus comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

5 a balloon coupled to a distal portion of the carrier and adapted to be in direct contact with a wall of the lumen after the carrier has been inserted into the lumen, the balloon having a characteristic thickness of no more than 20 microns.

51. The apparatus according to claim 50, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening of the GI tract.

10 52. The apparatus according to claim 51, wherein the GI tract includes a colon, and wherein the carrier is adapted to be inserted through the proximal opening of the colon.

53. The apparatus according to claim 51, wherein the balloon has a characteristic thickness of no more than 10 microns.

15 54. The apparatus according to claim 51, wherein an outer surface of the balloon in contact with the wall of the GI tract comprises a low friction coating suitable for facilitating sliding of the balloon against the wall of the GI tract.

55. The apparatus according to claim 51, wherein an outer surface of the balloon in contact with the wall of the GI tract comprises a hydrophilic substance suitable for facilitating sliding of the balloon against the wall of the GI tract.

20 56. The apparatus according to any one of claims 50-55, wherein the balloon is shaped so as to define a proximal lobe and a distal lobe, the lobes being in fluid communication with each other.

57. Apparatus for use with a biologically-compatible-fluid pressure source, comprising:

25 an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

a piston head coupled to a distal portion of the carrier and adapted to:

form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen, and

30 be withdrawn proximally through the body lumen in response to pressure from the fluid pressure source.

58. The apparatus according to claim 57, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the piston head is adapted to form the pressure seal with the wall of the GI tract after the carrier has been inserted into the GI tract.

5 59. The apparatus according to claim 58, wherein the GI tract includes a colon, and wherein the piston head is adapted to form the pressure seal with the wall of the colon after the carrier has been inserted into the colon.

60. The apparatus according to claim 58, wherein the piston head is adapted to be in direct contact with the wall of the GI tract after the carrier has been inserted into the GI tract.

10 61. The apparatus according to claim 58, wherein an outer surface of the piston head forming the pressure seal with the wall of the GI tract comprises a low friction coating suitable for facilitating sliding of the piston head against the wall of the GI tract.

15 62. The apparatus according to claim 58, wherein the piston head is shaped so as to define a proximal lobe and a distal lobe, the lobes being in fluid communication with each other.

63. The apparatus according to claim 58, comprising a pressure-application tube in fluid communication with (a) a distal site within the GI tract distal to the piston head, and (b) the fluid pressure source, the tube adapted to introduce the pressure to the distal site.

20 64. The apparatus according to claim 58, comprising:
a fluid source;
an image-capturing device, coupled to the carrier in a vicinity of a distal end of the carrier; and

at least one fluid supply tube coupled to the carrier, the tube in fluid communication with the fluid source,

25 wherein the distal end of the carrier is shaped so as to define one or more openings in fluid communication with the tube, the openings oriented so as to spray at least a portion of the image-capturing device when fluid is provided by the fluid source.

30 65. The apparatus according to any one of claims 57-64, wherein the apparatus is adapted to facilitate passage of fluid out of the GI tract from a proximal site within the GI tract proximal to the piston head.

66. The apparatus according to claim 65, comprising a vent tube in fluid communication with the proximal site and outside the GI tract, the tube adapted to facilitate passage of fluid from the proximal site to the outside, so as to reduce a pressure at the proximal site.

5 67. The apparatus according to claim 66, wherein the vent tube is adapted to passively permit the passage of the fluid from the proximal site.

68. The apparatus according to claim 66, comprising a suction source coupled to the vent tube, adapted to actively facilitate the passage of the fluid from the proximal site.

10 69. The apparatus according to any one of claims 57-64, wherein the piston head is adapted to be inflated so as to form and maintain the pressure seal with the wall of the GI tract.

70. The apparatus according to claim 69, comprising a piston-head-pressure sensor, adapted to sense a pressure within the piston head.

15 71. The apparatus according to claim 70, wherein the piston-head-pressure sensor is adapted to be disposed within the piston head.

72. The apparatus according to claim 70, wherein the piston-head-pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

73. The apparatus according to claim 72, wherein the piston-head-pressure sensor is adapted to be disposed outside of the GI tract.

20 74. The apparatus according to claim 69, comprising a distal pressure sensor, adapted to sense a pressure within the GI tract distal to the piston head.

75. The apparatus according to claim 74, wherein the distal pressure sensor is adapted to be disposed distal to the piston head.

25 76. The apparatus according to claim 74, wherein the distal pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

77. The apparatus according to claim 76, wherein the distal pressure sensor is adapted to be disposed outside of the GI tract.

78. The apparatus according to claim 69, comprising a proximal pressure sensor, adapted to sense a pressure within the GI tract proximal to the piston head.

79. The apparatus according to claim 78, wherein the proximal pressure sensor is adapted to be disposed in a vicinity of the piston head.

80. The apparatus according to claim 78, wherein the proximal pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

5 81. The apparatus according to claim 80, wherein the proximal pressure sensor is adapted to be disposed outside of the GI tract.

82. The apparatus according to claim 69, comprising:

a pressure sensor, adapted to measure a first pressure associated with operation of the apparatus; and

10 a control unit, adapted to regulate a second pressure associated with operation of the apparatus responsive to the measurement of the pressure sensor.

83. The apparatus according to claim 82, wherein the pressure sensor is adapted to measure a pressure selected from the list consisting of: a pressure distal to the piston head, a pressure proximal to the piston head, and a pressure within the piston head.

15 84. Apparatus comprising:

an elongate carrier adapted to be inserted through a proximal opening of a body lumen;

an annular balloon, shaped so as to form an opening therethrough for insertion of the carrier, the balloon adapted to be at least partially inserted into the proximal opening, and to be expandable to form a pressure seal between the balloon and a wall of the body lumen in a vicinity of the proximal opening;

first and second fluid pressure sources;

a first tube, coupled between the first pressure source and an interior of the balloon; and

25 a second tube, coupled between the second pressure source and an interior of the lumen distal to the annular balloon.

85. The apparatus according to claim 84, wherein the body lumen includes a colon, wherein the proximal opening includes a rectum, and wherein the balloon is adapted to be at least partially inserted into the rectum, and to be expandable to form the pressure seal between the balloon and the wall of the colon.

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86. The apparatus according to claim 85, wherein at least one of the first and second pressure sources is adapted to be positioned outside the colon.

87. The apparatus according to claim 85, comprising a ring coupled to the balloon, the ring adapted to abut against the rectum, and the ring shaped so as to form an opening
5 therethrough for insertion of the carrier.

88. The apparatus according to claim 85, wherein the first pressure source comprises a powered fluid pressure source.

89. The apparatus according to any one of claims 84-88, wherein the first pressure source comprises a manually-operated fluid pressure source.

10 90. The apparatus according to claim 89, wherein the manually-operated pressure source comprises a syringe.

91. Apparatus comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

15 an inflatable cuff, shaped so as to define an opening therethrough through which the carrier can be inserted, the cuff adapted to form a pressure seal with a wall of the body lumen when the cuff is in an inflated state in a vicinity of the proximal opening.

92. The apparatus according to claim 91, wherein the body lumen includes a colon, wherein the proximal opening includes a rectum, and wherein the carrier is adapted to be
20 inserted through the rectum of the colon.

93. Apparatus for use with a fluid source, the apparatus comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen;

an image-capturing device, fixed to the carrier in a vicinity of a distal end of the
25 carrier; and

at least one fluid supply tube coupled to the carrier, the tube in fluid communication with the fluid source,

wherein the distal end of the carrier is shaped so as to define one or more openings in fluid communication with the tube, the openings oriented so as to spray at least a
30 portion of the image-capturing device when fluid is provided by the fluid source.

94. The apparatus according to claim 93, wherein the body lumen includes a colon, and wherein the carrier is adapted to be inserted through the proximal opening of the colon.

95. The apparatus according to claim 94, wherein the distal end of the carrier is shaped so as to define between 4 and 10 openings through which the fluid flows when provided by the fluid source.

96. The apparatus according to claim 94, wherein the openings are disposed circumferentially about the distal end of the carrier.

97. The apparatus according to claim 94, wherein the openings are positioned at a circumferential angle, so as to create a vortex around the image-capturing device when the fluid is provided by the fluid source.

98. The apparatus according to any one of claims 93-97, wherein the image-capturing device comprises an optical member that is shaped so as to define a lateral surface configured to provide omnidirectional lateral viewing, and wherein the openings are oriented so as to spray at least a portion of the lateral surface of the optical member.

99. The apparatus according to claim 98, wherein the optical member is shaped so as to define a forward surface configured to provide forward viewing, and wherein the openings are oriented so as to spray at least a portion of the forward surface of the optical member.

100. Apparatus for use in a body lumen having a proximal opening, the apparatus comprising:

an elongate carrier, adapted to be inserted through the proximal opening of the lumen;

an image-capturing device, fixed in a first vicinity of a distal end of the carrier, and adapted to provide omnidirectional lateral viewing; and

an inflation element, fixed in a second vicinity of the distal end, and adapted to increase a diameter of the carrier in the second vicinity to an extent sufficient to position the image-capturing device a distance from a wall of the lumen sufficient to enable omnidirectional focusing of the image-capturing device.

101. The apparatus according to claim 100, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening of the GI tract.

5 102. The apparatus according to claim 101, wherein the inflation element is adapted to increase the diameter of the carrier in the second vicinity such that the image-capturing device is at least 15 mm from the wall.

103. The apparatus according to claim 101, wherein the inflation element comprises an expandable sponge.

10 104. The apparatus according to claim 101, wherein the inflation element comprises a set of one or more rings, selected from the list consisting of: inflatable rings, and expandable rings.

105. The apparatus according to claim 101, wherein the inflation element comprises an inflatable balloon.

15 106. The apparatus according to any one of claims 100-105, wherein the GI tract includes a colon, and wherein the carrier is adapted to be inserted through the proximal opening of the colon.

107. The apparatus according to claim 106, wherein the inflation element is adapted to increase the diameter of the carrier in the second vicinity to between 30 and 45 mm.

20 108. Apparatus for use in a body lumen having a proximal opening, the apparatus comprising:

first and second fluid pressure sources;

an elongate carrier, adapted to be inserted through the proximal opening of the body lumen;

25 an inflatable piston head coupled to a distal portion of the carrier, and adapted to form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen;

a first passageway in fluid communication with the first pressure source and a proximal portion of the lumen proximal to the piston head;

30 a second passageway in fluid communication with the second pressure source and the piston head;

first and second pressure sensors, adapted to measure a first measurable pressure in the proximal portion of the lumen, and a second measurable pressure in the piston head, respectively; and

5 a control unit, adapted to cause the piston head to be advanced distally in the lumen by:

while the first pressure source applies a first applied pressure to the proximal portion of the lumen,

10 regulating the second measurable pressure in the piston head to be equal to the first measurable pressure in the proximal portion of the lumen plus a positive value, by driving the second pressure source to apply a second applied pressure.

109. The apparatus according to claim 108, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the carrier is adapted to be inserted through the proximal opening of the GI tract.

110. The apparatus according to claim 109, wherein the GI tract includes a colon, and
15 wherein the carrier is adapted to be inserted through the proximal opening of the colon.

111. The apparatus according to claim 109, wherein the piston is adapted to be in direct contact with the wall of the GI tract after the carrier has been inserted into the GI tract.

112. The apparatus according to claim 109, comprising a third passageway in fluid communication with a portion of the GI tract distal to the piston head and a site outside
20 the GI tract.

113. The apparatus according to claim 109, wherein the first passageway has a diameter of between 3 and 6 mm.

114. The apparatus according to claim 109, wherein the first pressure sensor is adapted to be disposed in a vicinity of the piston head.

25 115. The apparatus according to any one of claims 108-114, wherein the first pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

116. The apparatus according to claim 115, wherein the first pressure sensor is adapted to be disposed outside of the GI tract.

117. The apparatus according to any one of claims 108-114, wherein the second
30 pressure sensor is adapted to be disposed within the piston head.

118. The apparatus according to any one of claims 108-114, wherein the second pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

119. The apparatus according to claim 118, wherein the second pressure sensor is adapted to be disposed outside of the GI tract.

120. The apparatus according to any one of claims 108-114, wherein the positive value is between 1 and 5 millibar.

121. The apparatus according to claim 120, wherein the positive value is between 1.5 and 2.5 millibar.

122. The apparatus according to any one of claims 108-114, wherein the control unit is adapted to set the second measurable pressure in the piston head at an initial value prior to application of the first applied pressure, by driving the second pressure source to apply the second applied pressure.

123. The apparatus according to claim 122, wherein the initial value is between 5 and 15 millibar, and wherein the control unit is adapted to set the second measurable pressure at between 5 and 15 millibar.

124. The apparatus according to claim 122, wherein the control unit is adapted to regulate the second measurable pressure to be equal to the greater of: (a) the initial value, and (b) the first measurable pressure plus the positive value.

125. Apparatus for use with a biologically-compatible-fluid pressure source, comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

a distal piston head coupled to a distal portion of the carrier and adapted to:

form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen, and

be advanced distally through the body lumen in response to pressure from the fluid pressure source applied to an external surface of the distal piston head.

126. The apparatus according to claim 125, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the distal piston head is adapted to form the

pressure seal with the wall of the GI tract after the carrier has been inserted into the GI tract.

127. The apparatus according to claim 126, wherein the GI tract includes a colon, and wherein the distal piston head is adapted to form the pressure seal with the wall of the colon after the carrier has been inserted into the colon.

128. The apparatus according to claim 126, wherein the distal piston head is adapted to be in direct contact with the wall of the GI tract after the carrier has been inserted into the GI tract.

129. The apparatus according to claim 126, wherein an outer surface of the distal piston head forming the pressure seal with the wall of the GI tract comprises a low friction coating suitable for facilitating sliding of the distal piston head against the wall of the GI tract.

130. The apparatus according to claim 126, comprising:

a fluid source;

an optical member coupled in a vicinity of the distal portion of the carrier; and

at least one fluid supply tube coupled to the carrier, the tube in fluid communication with the fluid source,

wherein the distal portion of the carrier is shaped so as to define one or more openings in fluid communication with the tube, the openings oriented so as to spray at least a portion of the optical member when fluid is provided by the fluid source.

131. The apparatus according to claim 126, comprising:

an optical system comprising an optical member configured to provide omnidirectional lateral viewing; and

an inflation element, fixed in a vicinity of the distal portion of the carrier, and adapted to increase a diameter of the carrier in the vicinity to an extent sufficient to position the optical member a distance from the wall sufficient to enable omnidirectional focusing of the optical system.

132. The apparatus according to any one of claims 125-131, wherein the apparatus is adapted to facilitate distal advancement of the distal piston head by facilitating passage of fluid out of the GI tract from a distal site within the GI tract distal to the distal piston head.

133. The apparatus according to claim 132, wherein the apparatus is adapted to facilitate the passage of an amount of the fluid out of the GI tract from the distal site sufficient to maintain a pressure of less than 10 millibar at the distal site.
- 5 134. The apparatus according to claim 132, wherein the apparatus is adapted to facilitate the passage of at least 100 cc of the fluid out of the GI tract from the distal site, per minute that the distal piston head advances distally.
135. The apparatus according to claim 134, wherein the apparatus is adapted to facilitate the passage of at least 300 cc of the fluid out of the GI tract from the distal site, per minute that the distal piston head advances distally.
- 10 136. The apparatus according to claim 132, wherein the apparatus is adapted to facilitate the passage of at least 3 cc of the fluid out of the GI tract from the distal site, per centimeter that the distal piston head advances distally.
137. The apparatus according to claim 136, wherein the apparatus is adapted to facilitate the passage of at least 10 cc of the fluid out of the GI tract from the distal site, per centimeter that the distal piston head advances distally.
- 15 138. The apparatus according to claim 132, comprising a vent tube, wherein the apparatus is adapted to facilitate the passage of the fluid out of the GI tract from the distal site within the GI tract through the vent tube.
139. The apparatus according to claim 138, wherein the vent tube is shaped to define an inner diameter thereof that is between 1 and 3 millimeters.
- 20 140. The apparatus according to claim 138, wherein the vent tube is adapted to passively permit the passage of the fluid out of the GI tract from the distal site within the GI tract.
141. The apparatus according to claim 138, wherein the vent tube is adapted to be coupled to a suction source, whereby to actively facilitate the passage of the fluid out of the GI tract from the distal site within the GI tract.
- 25 142. The apparatus according to claim 141, wherein the vent tube is adapted to be coupled to the suction source such that during operation of the apparatus, a pressure distal to the distal piston head is between -5 millibar and +15 millibar.

143. The apparatus according to claim 138, comprising a suction source coupled to the vent tube, adapted to actively facilitate the passage of the fluid out of the GI tract from the distal site within the GI tract.

144. The apparatus according to claim 143, wherein the suction source is adapted to
5 maintain a pressure distal to the distal piston head is between -5 millibar and +15 millibar.

145. The apparatus according to claim 132, wherein the distal piston head is adapted to be inflated so as to form and maintain the pressure seal with the wall of the GI tract, and wherein the distal piston head is adapted to be intermittently deflated at least in part, while in the GI tract, whereby to facilitate the passage of the fluid out of the GI tract from the
10 site within the GI tract distal to the distal piston head.

146. The apparatus according to any one of claims 125-131, wherein the distal piston head is adapted to be inflated so as to form and maintain the pressure seal with the wall of the GI tract.

147. The apparatus according to claim 146, comprising an auxiliary piston head,
15 coupled to the carrier at a position proximal to the distal piston head,
wherein the auxiliary piston head is adapted to be inflated so as to form and maintain an auxiliary pressure seal with the wall of the GI tract, and
wherein:

(a) at at least one time while the carrier is within the GI tract, the distal
20 piston head is adapted to be in a state of being already deflated at least in part, simultaneously with the auxiliary piston head being already inflated and being advanced distally through the GI tract in response to pressure from the fluid pressure source, and

(b) at at least one other time while the carrier is within the GI tract, the
25 auxiliary piston head is adapted to be in a state of being already deflated at least in part, simultaneously with the distal piston head being already inflated and being advanced distally through the GI tract in response to pressure from the fluid pressure source.

148. The apparatus according to claim 146, comprising a piston-head-pressure sensor,
30 adapted to sense a pressure within the distal piston head.

149. The apparatus according to claim 148, wherein the piston-head-pressure sensor is adapted to be disposed within the distal piston head.

150. The apparatus according to claim 148, wherein the piston-head-pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

151. The apparatus according to claim 150, wherein the piston-head-pressure sensor is adapted to be disposed outside of the GI tract.

5 152. The apparatus according to claim 146, comprising a distal pressure sensor, adapted to sense a pressure within the GI tract distal to the distal piston head.

153. The apparatus according to claim 152, wherein the distal pressure sensor is adapted to be disposed distal to the distal piston head.

10 154. The apparatus according to claim 152, wherein the distal pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

155. The apparatus according to claim 154, wherein the distal pressure sensor is adapted to be disposed outside of the GI tract.

15 156. The apparatus according to claim 146, comprising a proximal pressure sensor, adapted to sense a first measurable pressure, within a proximal portion of the GI tract proximal to the distal piston head.

157. The apparatus according to claim 156, comprising a distal pressure sensor, adapted to sense a pressure distal to the distal piston head.

158. The apparatus according to claim 156, wherein the proximal pressure sensor is adapted to be disposed in a vicinity of the distal piston head.

20 159. The apparatus according to claim 156, wherein the proximal pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

160. The apparatus according to claim 159, wherein the proximal pressure sensor is adapted to be disposed outside of the GI tract.

25 161. The apparatus according to claim 156, comprising a piston-head-pressure sensor, adapted to sense a second measurable pressure, within the distal piston head.

162. The apparatus according to claim 161, wherein the pressure source includes a first pressure source, adapted to apply a first applied pressure to the proximal portion of the GI tract, and comprising:

30 a second pressure source, adapted to apply a second applied pressure to an interior of the distal piston head; and

a control unit, adapted to advance the distal piston head distally in the GI tract by:

while the first pressure source applies the first applied pressure to the proximal portion,

regulating the second measurable pressure in the distal piston head to be equal to the first measurable pressure in the proximal portion of the GI tract plus a positive value, by driving the second pressure source to apply the second applied pressure.

163. The apparatus according to claim 146, comprising:

a pressure sensor, adapted to measure a first pressure associated with operation of the apparatus; and

a control unit, adapted to regulate a second pressure associated with operation of the apparatus responsive to the measurement of the pressure sensor.

164. The apparatus according to claim 163, wherein the pressure sensor is adapted to measure a pressure selected from the list consisting of: a pressure distal to the distal piston head, a pressure proximal to the distal piston head, and a pressure within the distal piston head.

165. The apparatus according to claim 163, wherein the control unit is adapted to regulate the pressure being measured by the pressure sensor.

166. The apparatus according to claim 163, wherein the control unit is adapted to regulate a pressure other than that being measured by the pressure sensor.

167. The apparatus according to claim 146, wherein the distal piston head is shaped to define a proximal lobe and a distal lobe, the lobes being in fluid communication with each other.

168. The apparatus according to claim 167,

wherein a volume of a first one of the lobes is adapted to decrease in response to a constriction of the GI tract adjacent thereto,

wherein a volume of a second one of the lobes is adapted to remain constant in the absence of a change in GI tract diameter adjacent thereto, even if the volume of the first lobe is decreased, and

wherein a pressure within the first and second lobes is equal in steady state, regardless of the decrease in volume of the first lobe.

169. The apparatus according to claim 146, wherein the distal piston head is adapted to be at an inflation pressure between 10 and 60 millibar during advancement through the GI tract.

170. The apparatus according to claim 169, wherein the distal piston head is adapted to advance through the GI tract in response to a pressure from the fluid pressure source that is between 30% and 100% of the inflation pressure.

171. The apparatus according to claim 170, wherein the distal piston head is adapted to advance through the GI tract in response to a pressure from the fluid pressure source that is between 50% and 100% of the inflation pressure.

172. The apparatus according to claim 169, wherein the distal piston head is adapted to be at an inflation pressure between 20 and 50 millibar during advancement through the GI tract.

173. The apparatus according to claim 172, wherein the distal piston head is adapted to be at an inflation pressure between 30 and 45 millibar during advancement through the GI tract.

174. The apparatus according to claim 173, wherein the distal piston head is adapted to advance through the GI tract in response to a pressure from the fluid pressure source that is between 30% and 100% of the inflation pressure.

175. The apparatus according to claim 174, wherein the distal piston head is adapted to advance through the GI tract in response to a pressure from the fluid pressure source that is between 50% and 100% of the inflation pressure.

176. The apparatus according to claim 175, wherein the distal piston head is adapted to advance through the GI tract in response to a pressure from the fluid pressure source that is between 50% and 80% of the inflation pressure.

177. The apparatus according to claim 146, wherein the distal piston head is shaped to define a distally-narrowing portion, and is adapted to be inserted into the GI tract such that a tip of the distally-narrowing portion points in a distal direction when the distal piston head is in the GI tract.

178. The apparatus according to claim 177, wherein a proximal base of the distally-narrowing portion has a characteristic fully-inflated diameter that is larger than a diameter of at least a part of the GI tract through which the distally-narrowing portion is adapted to

pass, whereby the base of the distally-narrowing portion does not inflate fully when the base is in that part of the GI tract.

179. Apparatus for use in a body lumen having a proximal opening, the apparatus comprising:

5 an elongate carrier, adapted to be inserted through the proximal opening of the body lumen;

 an inflatable piston head coupled to a distal portion of the carrier, and adapted to form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen; and

10 a biologically-compatible fluid proximal pressure source, adapted to be in fluid communication with a proximal portion of the lumen proximal to the piston head, and to apply pressure sufficient to advance the carrier distally through the body lumen.

180. The apparatus according to claim 179, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the piston head is adapted to form the pressure seal
15 with the wall of the GI tract.

181. The apparatus according to claim 180, wherein the GI tract includes a colon, and wherein the piston head is adapted to form the pressure seal with the wall of the colon.

182. The apparatus according to claim 180, wherein the piston head is adapted to be in direct contact with the wall of the GI tract.

20 183. The apparatus according to claim 180, comprising a first passageway, wherein the proximal pressure source is in the fluid communication with the proximal portion of the GI tract via the first passageway.

184. The apparatus according to any one of claims 179-183, comprising a piston pressure source, adapted to be in fluid communication with the piston head, and to apply
25 pressure to the piston head in order to inflate the piston head.

185. The apparatus according to claim 184, comprising a second passageway, wherein the piston pressure source is in the fluid communication with the piston head via the second passageway.

186. The apparatus according to any one of claims 179-183, comprising:

30 a proximal pressure sensor, adapted to measure a pressure in the proximal portion of the GI tract; and

a piston pressure sensor, adapted to measure a pressure in the piston head.

187. The apparatus according to any one of claims 179-183, comprising a proximal pressure sensor, adapted to measure a pressure in the proximal portion of the GI tract.

188. The apparatus according to claim 187, wherein the proximal pressure sensor is adapted to be disposed in a vicinity of the piston head.

189. The apparatus according to claim 187, wherein the proximal pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

190. The apparatus according to claim 189, wherein the proximal pressure sensor is adapted to be disposed outside of the GI tract.

191. The apparatus according to any one of claims 179-183, comprising a piston pressure sensor, adapted to measure a pressure in the piston head.

192. The apparatus according to claim 191, wherein the piston pressure sensor is adapted to be disposed within the piston head.

193. The apparatus according to claim 191, wherein the piston pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

194. The apparatus according to claim 193, wherein the piston pressure sensor is adapted to be disposed outside of the GI tract.

195. The apparatus according to any one of claims 179-183, comprising a vent tube, adapted to:

be in fluid communication with a distal portion of the GI tract distal to the piston head, and with outside of the GI tract, and

facilitate distal advancement of the piston head by facilitating passage of fluid out of the GI tract from the distal portion.

196. The apparatus according to claim 195, comprising a distal pressure sensor, adapted to measure a pressure in the distal portion of the GI tract.

197. The apparatus according to claim 196, wherein the distal pressure sensor is adapted to be disposed distal to the piston head.

198. The apparatus according to claim 196, wherein the distal pressure sensor is adapted to be disposed in a vicinity of the proximal opening of the GI tract.

199. The apparatus according to claim 198, wherein the distal pressure sensor is adapted to be disposed outside of the GI tract.

200. The apparatus according to claim 195, wherein the apparatus is adapted to facilitate the passage of an amount of the fluid out of the GI tract from the distal portion
5 sufficient to maintain a pressure of less than 10 millibar at the distal portion.

201. The apparatus according to claim 195, wherein the vent tube is adapted to passively permit the passage of the fluid out of the GI tract from the distal portion.

202. The apparatus according to claim 195, comprising a suction source coupled to the vent tube, adapted to actively facilitate the passage of the fluid out of the GI tract from the
10 distal portion.

203. The apparatus according to claim 195, wherein the apparatus is adapted to facilitate the passage of at least 100 cc of the fluid out of the GI tract from the distal portion, per minute that the piston head advances distally.

204. The apparatus according to claim 203, wherein the apparatus is adapted to
15 facilitate the passage of at least 300 cc of the fluid out of the GI tract from the distal portion, per minute that the piston head advances distally.

205. The apparatus according to claim 195, wherein the apparatus is adapted to facilitate the passage of at least 3 cc of the fluid out of the GI tract from the distal portion, per centimeter that the piston head advances distally.

206. The apparatus according to claim 205, wherein the apparatus is adapted to
20 facilitate the passage of at least 10 cc of the fluid out of the GI tract from the distal portion, per centimeter that the piston head advances distally.

207. Apparatus for use in a body lumen having a proximal opening, the apparatus comprising:

25 an elongate carrier, adapted to be inserted through the proximal opening of the body lumen;

an inflatable piston head coupled to a distal portion of the carrier, and adapted to form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen;

a biologically-compatible fluid proximal pressure source, adapted to be in fluid communication with a proximal portion of the lumen proximal to the piston head, and to apply pressure sufficient to advance the carrier distally through the body lumen; and

5 a piston head pressure sensor, adapted to sense a piston head pressure in the piston head, the piston head pressure sensor disposed in a vicinity of the proximal opening of the lumen, and in fluid communication with an interior of the piston head.

208. The apparatus according to claim 207, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the piston head is adapted to form the pressure seal with the wall of the GI tract.

10 209. The apparatus according to claim 208, wherein the GI tract includes a colon, and wherein the piston head is adapted to form the pressure seal with the wall of the colon.

210. The apparatus according to claim 208, wherein the piston head is adapted to be in direct contact with the wall of the GI tract.

15 211. The apparatus according to claim 208, wherein the piston head pressure sensor is adapted to be in fluid communication with the interior of the piston head via a passageway, a proximal end of which is disposed in the vicinity of the proximal opening of the GI tract.

212. The apparatus according to claim 208, wherein the piston head pressure sensor is adapted to be disposed outside of the GI tract.

20 213. The apparatus according to claim 208, comprising a biologically-compatible fluid piston head pressure source, adapted to be in fluid communication with the interior of the piston head via a passageway, wherein the piston head pressure sensor is adapted to be in fluid communication with the interior of the piston head via the passageway.

25 214. The apparatus according to any one of claims 207-213, comprising a proximal portion pressure sensor, adapted to sense a proximal portion pressure in the proximal portion of the GI tract, and disposed in a vicinity of the proximal opening of the GI tract.

215. The apparatus according to claim 214, wherein the proximal portion pressure sensor is adapted to be disposed outside of the GI tract.

30 216. The apparatus according to any one of claims 207-213, comprising a distal portion pressure sensor, adapted to sense a distal portion pressure in a distal portion of the GI tract

distal to the piston head, and disposed in a vicinity of the proximal opening of the GI tract.

217. The apparatus according to claim 216, wherein the distal portion pressure sensor is adapted to be disposed outside of the GI tract.

5 218. A method comprising:

forming a pressure seal between a piston head and a wall of a body lumen;

advancing the piston head distally through the body lumen by:

applying fluid pressure to an external surface of the piston head, and

10 facilitating passage of fluid out of the lumen from a site within the lumen distal to the piston head; and providing omnidirectional lateral viewing from a vicinity of the piston head.

219. The method according to claim 218, wherein the lumen includes a gastrointestinal (GI) tract, and wherein forming the pressure seal comprises forming the pressure seal
15 between the piston head and the wall of the GI tract.

220. The method according to claim 219, wherein the GI tract includes a colon, and wherein forming the pressure seal comprises forming the pressure seal between the piston head and the wall of the colon.

221. The method according to claim 219, wherein forming the pressure seal comprises
20 placing the piston head in direct contact with the wall of the GI tract.

222. The method according to claim 219, comprising providing distal forward viewing from the vicinity of the piston head.

223. The method according to claim 219, wherein facilitating the passage of the fluid out of the GI tract comprises facilitating the passage of the fluid out of the GI tract
25 through a vent tube.

224. The method according to any one of claims 218-223, wherein forming the pressure seal comprises inflating the piston head.

225. A method comprising:

forming a pressure seal between a wall of a body lumen and a piston head shaped so as to define a proximal lobe and a distal lobe in fluid communication with each other; and

5 advancing the piston head distally through the body lumen by applying fluid pressure to an external surface of the piston head.

226. The method according to claim 225, wherein the lumen includes a gastrointestinal (GI) tract, and wherein forming the pressure seal comprises forming the pressure seal between the wall of the GI tract and the piston head.

10 227. The method according to claim 226, wherein the GI tract includes a colon, and wherein forming the pressure seal comprises forming the pressure seal between the wall of the GI tract and the colon.

228. The method according to claim 226, wherein forming the pressure seal comprises placing the piston head in direct contact with the wall of the GI tract.

15 229. The method according to any one of claims 225-228, wherein advancing the piston head distally comprises facilitating passage of fluid out of the GI tract from a site within the GI tract distal to the piston head, via a flexible vent tube that passes through the proximal and distal lobes of the piston head, and opens to the site.

230. A method comprising:

20 providing an elongate carrier having a balloon coupled to a distal portion thereof, the balloon having a hydrophilic substance disposed at an external surface thereof; and
 inserting the elongate carrier through a proximal opening of a body lumen, such that the balloon comes in direct contact with a wall of the lumen.

25 231. The method according to claim 230, wherein the lumen includes a gastrointestinal (GI) tract, and wherein inserting the elongate carrier comprises inserting the elongate carrier through the proximal opening of the GI tract.

232. The method according to claim 231, wherein the GI tract includes a colon, and wherein inserting the elongate carrier comprises inserting the elongate carrier through the proximal opening of the colon.

233. A method comprising:

providing an elongate carrier having a balloon coupled to a distal portion thereof, an outer surface of the balloon having a low friction coating suitable for facilitating sliding of the balloon against the wall of the lumen; and

5 inserting the elongate carrier through a proximal opening of a body lumen, such that the outer surface of the balloon comes in direct contact with a wall of the lumen.

234. The method according to claim 233, wherein the lumen includes a gastrointestinal (GI) tract, and wherein inserting the elongate carrier comprises inserting the elongate carrier through the proximal opening of the GI tract.

10 235. The method according to claim 234, wherein the GI tract includes a colon, and wherein inserting the elongate carrier comprises inserting the elongate carrier through the proximal opening of the colon.

236. A method comprising:

providing an elongate carrier having a balloon coupled to a distal portion thereof, the balloon having a characteristic thickness of no more than 20 microns; and

15 inserting the elongate carrier through a proximal opening of a body lumen, such that the balloon comes in direct contact with a wall of the lumen.

237. The method according to claim 236, wherein the lumen includes a gastrointestinal (GI) tract, and wherein inserting the elongate carrier comprises inserting the elongate carrier through the proximal opening of the GI tract.

20 238. The method according to claim 237, wherein the GI tract includes a colon, and wherein inserting the elongate carrier comprises inserting the elongate carrier through the proximal opening of the colon.

239. A method comprising:

forming a pressure seal between a piston head and a wall of a body lumen; and

25 applying fluid pressure to an external surface of the piston head to withdraw the piston head proximally through the body lumen.

240. The method according to claim 239, wherein the lumen includes a gastrointestinal (GI) tract, and wherein forming the pressure seal comprises forming the pressure seal between the piston head and the wall of the GI tract.

241. The method according to claim 240, wherein the GI tract includes a colon, and wherein forming the pressure seal comprises forming the pressure seal between the piston head and the wall of the colon.

242. The method according to claim 240, wherein forming the pressure seal comprises placing the piston head in direct contact with the wall of the GI tract.

243. The method according to claim 240, comprising facilitating passage of fluid out of the GI tract from a proximal site within the GI tract proximal to the piston head.

244. The method according to any one of claims 239-243, wherein forming the pressure seal comprises inflating the piston head.

245. A method comprising:

inserting an annular balloon at least partially into a proximal opening of a body lumen;

expanding the balloon to form a seal between the balloon and a wall of the body lumen in a vicinity of the proximal opening;

inserting an elongate carrier into the lumen through an opening that passes through the balloon; and

applying pressure to an interior of the lumen distal to the balloon.

246. The method according to claim 245,

wherein the body lumen includes a colon,

wherein the proximal opening includes a rectum,

wherein inserting the balloon comprises inserting the balloon at least partially into the rectum, and

wherein expanding the balloon comprises expanding the balloon to form the pressure seal between the balloon and the wall of the colon.

247. The method according to claim 246, wherein expanding the balloon comprises applying pressure to an interior of the balloon using a syringe.

248. A method comprising:

inserting an inflatable cuff at least partially into a proximal opening of a body lumen;

inflating the cuff to form a seal with a wall of the body lumen in a vicinity of the proximal opening; and

inserting an elongate carrier into the lumen through an opening that passes through the cuff.

249. The method according to claim 248, wherein the body lumen includes a colon, wherein the proximal opening includes a rectum, and wherein inflating the cuff comprises
5 inflating the cuff to form the seal with the wall of the colon in the vicinity of the rectum.

250. A method comprising:

inserting, through a proximal opening of a body lumen, an elongate carrier having an image-capturing device fixed thereto in a vicinity of a distal end thereof; and

10 spraying, from one or more openings in the distal end of the carrier, fluid onto at least a portion of the image-capturing device.

251. The method according to claim 250, wherein the body lumen includes a colon, and wherein inserting the carrier comprises inserting the carrier through the proximal opening of the colon.

252. A method comprising:

15 inserting, through a proximal opening of a body lumen, an elongate carrier having an image-capturing device fixed thereto in a first vicinity of a distal end of the carrier, for providing omnidirectional lateral viewing; and

20 increasing a diameter of the carrier in a second vicinity of the distal end to an extent sufficient to position the image-capturing device a distance from a wall of the lumen sufficient to enable omnidirectional focusing of the image-capturing device.

253. The method according to claim 252, wherein the lumen includes a gastrointestinal (GI) tract, and wherein inserting the carrier comprises inserting the carrier through the proximal opening of the GI tract.

254. The method according to claim 253, wherein increasing the diameter comprises
25 increasing the diameter of the carrier in the second vicinity such that the image-capturing device is at least 15 mm from the wall.

255. The method according to any one of claims 252-254, wherein the GI tract includes a colon, and wherein inserting the carrier comprises inserting the carrier through the proximal opening of the colon.

30 256. The method according to claim 255, wherein increasing the diameter comprises increasing the diameter of the carrier in the second vicinity to between 30 and 45 mm.

257. A method comprising:

forming a pressure seal between an inflatable piston head and a wall of a body lumen;

measuring a first measurable pressure in a proximal portion of the lumen proximal

5 to the piston head, and a second measurable pressure in the piston head; and

advancing the piston head distally through the lumen by:

applying a first applied pressure to the proximal portion of the lumen, and

10 regulating the second measurable pressure in the piston head to be equal to the first measurable pressure in the proximal portion of the lumen plus a positive value, by applying a second applied pressure to piston head.

258. The method according to claim 257, wherein the lumen includes a gastrointestinal (GI) tract, and wherein forming the pressure seal comprises forming the pressure seal
15 between the piston head and the wall of the GI tract.

259. The method according to claim 258, wherein the GI tract includes a colon, and wherein forming the pressure seal comprises forming the pressure seal between the piston head and the wall of the colon.

260. The method according to claim 258, wherein forming the pressure seal comprises
20 placing the piston head in direct contact with the wall of the GI tract.

261. The method according to claim 258, comprising facilitating passage of fluid out of the GI tract from a portion of the GI tract distal to the piston head.

262. The method according to any one of claims 257-261, wherein the positive value is between 1 and 5 millibar.

25 263. The method according to claim 262, wherein the positive value is between 1.5 and 2.5 millibar.

264. The method according to any one of claims 257-261, wherein regulating the second measurable pressure comprises setting the second measurable pressure in the piston head at an initial value prior to application of the first applied pressure.

265. The method according to claim 264, wherein the initial value is between 5 and 15 millibar, and wherein setting the second measurable pressure comprises setting the second measurable pressure at between 5 and 15 millibar.

266. The method according to claim 264, wherein regulating the second measurable pressure comprises regulating the second measurable pressure to be equal to the greater of: (a) the initial value, and (b) the first measurable pressure plus the positive value.

267. A method comprising:

forming a pressure seal between a distal piston head and a wall of a body lumen;

and

10 applying fluid pressure to an external surface of the distal piston head to advance the piston head distally through the lumen.

268. The method according to claim 267, wherein the lumen includes a gastrointestinal (GI) tract, and wherein forming the pressure seal comprises forming the pressure seal between the distal piston head and the wall of the GI tract.

15 269. The method according to claim 268, wherein the GI tract includes a colon, and wherein forming the pressure seal comprises forming the pressure seal between the distal piston head and the wall of the colon.

270. The method according to claim 268, wherein forming the pressure seal comprises placing the distal piston head in direct contact with the wall of the GI tract.

20 271. The method according to any one of claims 267-270, comprising facilitating distal advancement of the distal piston head by facilitating passage of fluid out of the GI tract from a distal site within the GI tract distal to the distal piston head.

272. The method according to claim 271, wherein facilitating the passage of the fluid comprises facilitating the passage of an amount of the fluid out of the GI tract from the
25 distal site sufficient to maintain a pressure of less than 10 millibar at the distal site.

273. The method according to claim 271, wherein facilitating the passage of the fluid comprises facilitating the passage of at least 100 cc of the fluid out of the GI tract from the distal site, per minute that the distal piston head advances distally.

274. The method according to claim 273, wherein facilitating the passage of the fluid
30 comprises facilitating the passage of at least 300 cc of the fluid out of the GI tract from the distal site, per minute that the distal piston head advances distally.

275. The method according to claim 271, wherein facilitating the passage of the fluid comprises facilitating the passage of at least 3 cc of the fluid out of the GI tract from the distal site, per centimeter that the distal piston head advances distally.

5 276. The method according to claim 275, wherein facilitating the passage of the fluid comprises facilitating the passage of at least 10 cc of the fluid out of the GI tract from the distal site, per centimeter that the distal piston head advances distally.

277. The method according to claim 271, wherein facilitating the passage of the fluid comprises facilitating the passage of the fluid out of the GI tract from the distal site within the GI tract through a vent tube.

10 278. The method according to claim 277, wherein facilitating the passage of the fluid comprises passively permitting the passage of the fluid out of the GI tract from the distal site within the GI tract.

279. The method according to claim 277, wherein facilitating the passage of the fluid comprises actively facilitating the passage of the fluid out of the GI tract from the distal
15 site within the GI tract, by applying suction to a proximal end of the vent tube.

280. The method according to claim 279, wherein actively facilitating the passage of the fluid comprises regulating a pressure distal to the distal piston head to be between -5 millibar and +15 millibar.

281. The method according to claim 271, wherein forming the pressure seal comprises
20 inflating the distal piston head, and wherein facilitating the passage of the fluid comprises intermittently deflating, at least in part, the distal piston head, while in the GI tract.

282. The method according to any one of claims 267-270, wherein forming the pressure seal comprises inflating the distal piston head.

283. The method according to claim 282, comprising forming, at a position proximal to
25 the distal piston head, an auxiliary pressure seal between an auxiliary piston head and the wall of the GI tract, by inflating the auxiliary piston head.

284. The method according to claim 282, wherein inflating the distal piston head comprises sensing a pressure within the distal piston head.

285. The method according to claim 282, comprising sensing a pressure within the GI
30 tract distal to the distal piston head.

286. The method according to claim 282, wherein inflating the distal piston head comprises inflating the distal piston head to an inflation pressure between 10 and 60 millibar during advancement through the GI tract.

287. The method according to claim 282, comprising sensing a first measurable pressure, within a proximal portion of the GI tract proximal to the distal piston head.

288. The method according to claim 287, comprising sensing a pressure distal to the distal piston head.

289. The method according to claim 287, wherein inflating the distal piston head comprises sensing a second measurable pressure within the distal piston head.

290. The method according to claim 289, wherein applying the fluid pressure comprises applying a first applied pressure to the proximal portion of the GI tract,

wherein inflating the distal piston head comprises applying a second applied pressure to an interior of the distal piston head, and

wherein applying the fluid pressure comprises advancing the distal piston head distally in the GI tract by:

while applying the first applied pressure to the proximal portion,

regulating the second measurable pressure in the distal piston head to be equal to the first measurable pressure in the proximal portion of the GI tract plus a positive value, by applying the second applied pressure.

291. A method comprising:

forming a pressure seal between a piston head and a wall of a body lumen;

applying fluid pressure to an external surface of the distal piston head to advance the piston head distally through the lumen; and

sensing, at a vicinity of a proximal opening of the lumen, a piston head pressure in the piston head.

292. The method according to claim 291, wherein the lumen includes a gastrointestinal (GI) tract, and wherein forming the pressure seal comprises forming the pressure seal between the piston head and the wall of the GI tract.

293. The method according to claim 292, wherein the GI tract includes a colon, and wherein forming the pressure seal comprises forming the pressure seal between the piston head and the wall of the colon.

294. The method according to claim 292, wherein forming the pressure seal comprises placing the piston head in direct contact with the wall of the GI tract.

295. The method according to claim 292, wherein sensing the piston head pressure comprises sensing the piston head pressure via a passageway in fluid communication with an interior of the piston head, when a proximal end of the passageway is disposed in the vicinity of the proximal opening of the GI tract.

296. The method according to claim 292, wherein sensing the piston head pressure comprises sensing the piston head pressure from outside of the GI tract.

297. The method according to claim 292, wherein sensing the piston head pressure comprises sensing the piston head pressure via a passageway, and comprising applying fluid pressure to an interior of the piston head via the passageway.

298. The method according to any one of claims 291-297, comprising sensing, at a vicinity of the proximal opening of the GI tract, a proximal portion pressure in the proximal portion of the GI tract.

299. The method according to claim 298, wherein sensing the proximal portion pressure comprises sensing the proximal portion pressure from outside of the GI tract.

300. The method according to any one of claims 291-297, comprising sensing, at a vicinity of the proximal opening of the GI tract, a distal portion pressure in a distal portion of the GI tract distal to the piston head.

301. The method according to claim 300, wherein sensing the distal portion pressure comprises sensing the distal portion pressure from outside of the GI tract.

302. Apparatus for use with a biologically-compatible-fluid pressure source, comprising:

an elongate carrier, adapted to be inserted through a proximal opening of a body lumen; and

a distal piston head coupled to a distal portion of the carrier and adapted to:

be in direct contact with a wall of the lumen when the carrier is inserted into the lumen,

be advanced distally through the body lumen in response to pressure from the fluid pressure source, and

facilitate passage of fluid out of the lumen from a site within the lumen distal to the piston head.

5 303. The apparatus according to claim 302, wherein an outer surface of the piston head in contact with the wall of the lumen comprises a low friction coating suitable for facilitating sliding of the piston head against the wall of the lumen.

304. The apparatus according to any one of claims 302-303, wherein the lumen includes a gastrointestinal (GI) tract, and wherein the piston head is adapted to be in direct
10 contact with a wall of the GI tract when the carrier is inserted into the GI tract.

305. The apparatus according to claim 304, wherein the GI tract includes a colon, and wherein the piston head is adapted to be in direct contact with a wall of the colon when the carrier is inserted into the colon.

306. The apparatus according to claim 305, wherein the apparatus comprises a vent
15 tube, and wherein the piston head is adapted to facilitate the passage of the fluid out of the lumen through the vent tube.

307. The apparatus according to claim 306, wherein the vent tube is shaped to define an inner diameter thereof that is between 1 and 3 millimeters.

308. The apparatus according to claim 306, wherein the vent tube is adapted to
20 passively permit the passage of the fluid out of the lumen.

309. The apparatus according to claim 306, wherein the vent tube is adapted to be coupled to a suction source, whereby to actively facilitate the passage of the fluid out of the lumen.

310. The apparatus according to claim 309, wherein the vent tube is adapted to be
25 coupled to the suction source such that during operation of the apparatus, a pressure distal to the piston head is between -5 millibar and +15 millibar.

311. The apparatus according to claim 305, wherein the piston head is adapted to be inflated so as to attain and maintain the direct contact with the wall of the colon.

312. The apparatus according to claim 311,
30 wherein the apparatus comprises an auxiliary piston head, coupled to the carrier at a position proximal to the distal piston head,

wherein the auxiliary piston head is adapted to be inflated so as to attain and maintain direct contact with the wall of the colon, and

wherein:

(a) at at least one time while the carrier is within the body lumen, the distal piston head is adapted to be in a state of being already deflated at least in part simultaneously with the auxiliary piston head being already inflated and being advanced distally through the colon in response to pressure from the fluid pressure source, and

(b) at at least one other time while the carrier is within the body lumen, the auxiliary piston head is adapted to be in a state of being already deflated at least in part simultaneously with the distal piston head being already inflated and being advanced distally through the colon in response to pressure from the fluid pressure source.

313. The apparatus according to claim 311, wherein the piston head is adapted to be intermittently deflated at least in part, while in the colon, whereby to facilitate the passage of the fluid out of the lumen from the site within the lumen distal to the piston head.

314. The apparatus according to claim 311, wherein the apparatus comprises a piston-head-pressure sensor, adapted to sense a pressure within the piston head.

315. The apparatus according to claim 311, wherein the apparatus comprises a distal pressure sensor, adapted to sense a pressure within the colon distal to the piston head.

316. The apparatus according to claim 311, wherein the apparatus comprises a proximal pressure sensor, adapted to sense a pressure within the colon proximal to the piston head.

317. The apparatus according to claim 316, wherein the apparatus comprises a piston-head-pressure sensor, adapted to sense a pressure within the piston head.

318. The apparatus according to claim 316, wherein the apparatus comprises a distal pressure sensor, adapted to sense a pressure distal to the piston head.

319. The apparatus according to claim 311, wherein the apparatus comprises:
a pressure sensor, adapted to measure a first pressure associated with operation of the apparatus; and

a control unit, adapted to regulate a second pressure associated with operation of the apparatus responsive to the measurement of the pressure sensor.

320. The apparatus according to claim 319, wherein the pressure sensor is adapted to measure a pressure selected from the list consisting of: a pressure distal to the piston head, a pressure proximal to the piston head, and a pressure within the piston head.

5 321. The apparatus according to claim 319, wherein the control unit is adapted to regulate the pressure being measured by the pressure sensor.

322. The apparatus according to claim 319, wherein the control unit is adapted to regulate a pressure other than that being measured by the pressure sensor.

323. The apparatus according to claim 311, wherein the piston head is shaped to define a proximal lobe and a distal lobe, the lobes being in fluid communication with each other.

10 324. The apparatus according to claim 323,
wherein a volume of a first one of the lobes is adapted to decrease in response to a constriction of the colon adjacent thereto,
wherein a volume of a second one of the lobes is adapted to remain constant in the absence of a change in colon diameter adjacent thereto, even if the volume of the first
15 lobe is decreased, and

wherein a pressure within the first and second lobes is equal in steady state, regardless of the decrease in volume of the first lobe.

325. The apparatus according to claim 311, wherein the piston head is adapted to be at an inflation pressure between 10 and 60 millibar during advancement through the colon.

20 326. The apparatus according to claim 325, wherein the piston head is adapted to advance through the colon in response to a pressure from the fluid pressure source that is between 30% and 100% of the inflation pressure.

327. The apparatus according to claim 326, wherein the piston head is adapted to advance through the colon in response to a pressure from the fluid pressure source that is
25 between 50% and 100% of the inflation pressure.

328. The apparatus according to claim 325, wherein the piston head is adapted to be at an inflation pressure between 20 and 50 millibar during advancement through the colon.

329. The apparatus according to claim 328, wherein the piston head is adapted to be at an inflation pressure between 30 and 45 millibar during advancement through the colon.

330. The apparatus according to claim 329, wherein the piston head is adapted to advance through the colon in response to a pressure from the fluid pressure source that is between 30% and 100% of the inflation pressure.

5 331. The apparatus according to claim 330, wherein the piston head is adapted to advance through the colon in response to a pressure from the fluid pressure source that is between 50% and 100% of the inflation pressure.

332. The apparatus according to claim 331, wherein the piston head is adapted to advance through the colon in response to a pressure from the fluid pressure source that is between 50% and 80% of the inflation pressure.

10 333. The apparatus according to claim 311, wherein the piston head is shaped to define a distally-narrowing portion, and is adapted to be inserted into the colon such that a tip of the distally-narrowing portion points in a distal direction when the piston head is in the colon.

15 334. The apparatus according to claim 333, wherein a proximal base of the distally-narrowing portion has a characteristic fully-inflated diameter that is larger than a diameter of at least a part of the colon through which the distally-narrowing portion is adapted to pass, whereby the base of the distally-narrowing portion does not inflate fully when the base is in that part of the colon.

20 335. A method, comprising:
placing a distal piston head in direct contact with a wall of a body lumen;
applying fluid pressure to the distal piston head to advance the piston head distally through the body lumen; and
facilitating passage of fluid out of the lumen from a site within the lumen distal to the piston head.

25 336. The method according to claim 335, comprising applying a low friction coating to an outer surface of the piston head intended for contact with the wall of the lumen, the low friction coating being suitable for facilitating sliding of the piston head against the wall of the lumen.

30 337. The method according to any one of claims 335-336, wherein the lumen includes a gastrointestinal (GI) tract, and wherein placing the piston head comprises placing the piston head in direct contact with a wall of the GI tract.

338. The method according to claim 337, wherein the GI tract includes a colon, and wherein placing the piston head includes placing the piston head in direct contact with a wall of the colon.

5 339. The method according to claim 338, wherein facilitating the passage of the fluid comprises facilitating the passage of the fluid out of the lumen through a vent tube extending from the site distal to the piston head to a site outside of the lumen.

340. The method according to claim 339, wherein facilitating the passage of the fluid comprises passively permitting the passage of the fluid through the vent tube and out of the lumen.

10 341. The method according to claim 339, wherein facilitating the passage of the fluid comprises actively removing the fluid from the lumen.

342. The method according to claim 341, wherein actively removing the fluid comprises applying to the site distal to the piston head a pressure between -5 millibar and +15 millibar.

15 343. The method according to claim 338, wherein placing the piston head in direct contact with the wall comprises inflating the piston head to an extent sufficient to attain and maintain the direct contact with the wall of the colon.

344. The method according to claim 343, wherein the method comprises:

placing an auxiliary piston head proximal to the distal piston head;

20 inflating the auxiliary piston head to an extent sufficient to attain and maintain direct contact with the wall of the colon;

at at least one time while the distal piston head is within the body lumen, deflating the distal piston head at least in part, such that at a post-distal-piston-head-deflation time when the distal piston head is in a state of being already deflated at least in part, the
25 auxiliary piston head is inflated and advancing distally through the colon in response to the applied fluid pressure; and

at at least one other time while the distal piston head is within the body lumen, deflating the auxiliary piston head at least in part, such that at a post-auxiliary-piston-head-deflation time when the auxiliary piston head is in a state of being already deflated
30 at least in part, the distal piston head is inflated and advancing distally through the colon in response to the applied pressure.

345. The method according to claim 343, wherein facilitating the passage of the fluid out of the lumen comprises intermittently deflating the piston head at least in part.

346. The method according to claim 343, wherein the method comprises sensing a pressure within the piston head.

5 347. The method according to claim 343, wherein the method comprises sensing a pressure within the colon distal to the piston head.

348. The method according to claim 343, wherein the method comprises sensing a pressure within the colon proximal to the piston head.

349. The method according to claim 348, wherein the method comprises sensing a
10 pressure within the piston head.

350. The method according to claim 348, wherein the method comprises sensing a pressure distal to the piston head.

351. The method according to claim 343, wherein the method comprises:
sensing a first pressure associated with performing the method; and
15 regulating a second pressure associated with performing the method, responsive to sensing the first pressure.

352. The method according to claim 351, wherein sensing the first pressure comprises sensing a pressure selected from the list consisting of: a pressure distal to the piston head, a pressure proximal to the piston head, and a pressure within the piston head.

20 353. The method according to claim 351, wherein regulating the second pressure comprises regulating the first pressure.

354. The method according to claim 351, wherein regulating the second pressure does not include regulating the first pressure.

355. The method according to claim 343, wherein inflating the piston head comprises
25 inflating the piston head at an inflation pressure between 10 and 60 millibar.

356. The method according to claim 355, wherein applying the fluid pressure comprises setting the fluid pressure to between 30% and 100% of the inflation pressure.

357. The method according to claim 356, wherein applying the fluid pressure comprises setting the fluid pressure to between 50% and 100% of the inflation pressure.

358. The method according to claim 355, wherein inflating the piston head comprises inflating the piston head at an inflation pressure between 20 and 50 millibar.

359. The method according to claim 358, wherein inflating the piston head comprises inflating the piston head at an inflation pressure between 30 and 45 millibar.

5 360. The method according to claim 359, wherein applying the fluid pressure comprises setting the fluid pressure to between 30% and 100% of the inflation pressure.

361. The method according to claim 360, wherein applying the fluid pressure comprises setting the fluid pressure to between 50% and 100% of the inflation pressure.

10 362. The method according to claim 361, wherein applying the fluid pressure comprises setting the fluid pressure to between 50% and 80% of the inflation pressure.

363. A system comprising:

a guide member at least partially insertable into a proximal opening of a body lumen, said guide member including a first passageway connectable to a source of fluid pressure;

15 an elongate carrier arranged for sliding movement through said guide member; and

a piston head mounted on said carrier, wherein a greater fluid pressure acting on a proximal side of said piston head than on a distal side of said piston head propels said piston head and said carrier in a distal direction in the body lumen.

20 364. The system according to claim 363, wherein said piston head is inflatable.

365. The system according to claim 364, wherein said carrier includes a second passageway in fluid communication with said piston head and connectable to a source of fluid pressure for inflating said piston head.

25 366. The system according to claim 363, further comprising a vent tube passing through said piston head, having an opening distal to said piston head through which fluid is ventable to the outside.

367. The system according to any one of claims 363-366, further comprising an image-capturing device mounted on said carrier.

30 368. The system according to claim 367, wherein said image-capturing device is distal to said piston head.

369. The system according to claim 367, further comprising a power supply tube passing through said carrier and connected to said image-capturing device.

370. The system according to any one of claims 363-366, further comprising a fluid supply tube passing through said carrier and connectable to a fluid source.

5 371. The system according to any one of claims 363-366, further comprising an auxiliary piston head mounted on said carrier proximal to the first-mentioned piston head.

372. The system according to claim 371, wherein said auxiliary piston head is fixed axially to said carrier at a fixed distance from the first-mentioned piston head.

10 373. The system according to claim 371, wherein said auxiliary piston head is inflatable.

374. The system according to claim 373, wherein said carrier includes a third passageway in fluid communication with said auxiliary piston head and connectable to a source of fluid pressure for inflating said auxiliary piston head.

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